This document includes Section 1.0 – Introduction and Table of Contents of the Draft EPA Report "Surface Vessel Bilgewater/Oil Water Separator Environmental Effects Analysis Report" published in 2003. The reference number is: EPA-842-D-06-018

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Environmental Effects Analysis Report Surface Vessel Bilgewater/Oil Water Separator

Section 1.0 – Introduction and Table of Contents

2003

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ENVIRONMENTAL EFFECTS ANALYSIS REPORT

SURFACE VESSEL BILGEWATER/
OIL WATER SEPARATOR (OWS)

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U.S. Department of the Navy

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U.S. Environmental Protection Agency

SECTION 1.0 – INTRODUCTION

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BCC	Bioaccumulative Contaminant of Concern
BOD	Biochemical Oxygen Demand
CAS	Chemical Abstract Services; Refers to the CAS number, a unique numeric identifier for each chemical constituent. Constituents without CAS numbers, that were identified in vessel discharges, were assigned proxy CAS numbers, e.g., classicals and class based constituents.
ChAR	Characterization Analysis Report
CH3D	Curvilinear-grid Hydrodynamics 3D model
CHT	Collection, Holding, and Transfer
CI	Compression Ignition
CMC	Criterion Maximum Concentration
COC	Constituent of Concern
DFM	Diesel Fuel Marine
DoD	Department of Defense
EEA	Environmental Effects Analysis
EEAR	Environmental Effects Analysis Report
EOMZ	Edge of Mixing Zone (35 m from EOP)
EOP	End of Pipe
EPA	United States Environmental Protection Agency
FIAR	Feasibility Impact Analysis Report
HEM	Hexane Extractable Material
HI	Hazard Index (sum of constituent HQs)
HQ	Hazard Quotient
MF	Microfiltration
MPCD	Marine Pollution Control Device
NAVSEAINST	Naval Sea Systems Command Instruction
NF	Nanofiltration
NIS	Non-Indigenous Species
OCM	Oil Content Monitor
OPNAVINST	Operating Naval Instruction
OWHT	Oily Waste Holding Tank
OWS	Oil Water Separator
P2	Pollution Prevention
TEC	Toxicological Endpoint Concentration
TPE	Toxic Pound Equivalent
TSS	Total Suspended Solids
TWF	Toxic Weighting Factor
UF	Ultrafiltration
UNDS	Uniform National Discharge Standards
WQC	Water Quality Criteria

1.0 INTRODUCTION

The bilge of a surface ship is the lowest inner part of the interior hull where liquid drains from the interior spaces and the upper areas of the vessel (EPA and DoD, 1999). All vessels generate bilgewater and most commissioned Armed Forces vessels are fitted with oil water separator (OWS) systems designed to prevent the discharge of oil in excess of 15 mg/L within 12 nm (in accordance with OPNAVINST 5090.1B).

The composition of bilgewater varies among vessel classes. Shipboard wastestreams, such as steam condensate, boiler blowdown, drinking fountain water, and sink drainage located in various machinery spaces are designed to drain into the bilge on some ships. Leaks from tanks, pump packing glands as well as leaking piping, valves, and flanges contribute to the bilge in varying amounts, depending upon their age and maintenance histories. Spills from the ship's propulsion and auxiliary systems, runoff from housekeeping (e.g. washing of deckplates or equipment) as well as precipitation and greenwater, also can enter the bilge. The water may be contaminated with oily constituents comprised primarily of JP-5 fuel (used for powering aircraft), F-76 (used to power emergency diesel generators), 2190TEP lube oil (used for lubricating main engines and auxiliary equipment), and MIL-D-9250 lube oil (used to lubricate emergency diesel generators). To a lesser extent, hydraulic oil (used for elevators, cranes, and winches) and various grades of grease lubricants (used on pulleys, cables, valves, and other components) may be found in the bilgewater. Other significant contributions to water constituents include detergents (or surfactants), corrosion products from metal surfaces and discharges from sinks used to perform maintenance on engine room equipment. Bilgewater sampling during Uniform National Discharge Standards (UNDS) Phase I identified more than 25 priority pollutants, including metals, organics, and bioaccumulative contaminants of concern (BCC) known to cause persistent toxic effects to aquatic and terrestrial life and humans (EPA and DoD, 1999).

This EEAR includes the analysis of the baseline discharges[1] and the discharges controlled by MPCD options that "passed" the MPCD screen. The MPCD screening process is described in the Marine Pollution Control Device Screen Criteria Guidance (Navy and EPA, 2000c.). The following MPCDs passed the screening process:

- Gravity Coalescence (Navy and EPA, 2000f);
- Centrifuge (Navy and EPA, 2000e);
- Hydrocyclone (Navy and EPA, 2000g);
- Filter Media (Navy and EPA, 2001d);
- Membrane Filtration (Navy and EPA, 2001e); and
- Collection, Holding, and Transfer (CHT) (Navy and EPA, 2001c).

The first three MPCD options (gravity coalescence, hydrocyclone, and centrifuge) are primary treatments that may each be combined with one of the two screen-passing secondary treatments (filter media and membrane filtration). As noted in the *Characterization Analysis Report: Surface Vessel Bilgewater/OWS Discharge* (hereafter referred to as the Bilgewater

[1] The baseline discharge from this vessel group is not discharged overboard.

Characterization Analysis Report (ChAR)) (Navy and EPA, 2002a), the gravity coalescence, hydrocyclone, and centrifuge options are assumed to have sufficiently similar oil-water and particulate separating performance potential to allow all three OWS options to be represented by gravity coalescence (Navy and EPA, 2002c). Therefore, for the purposes of examining environmental effects, only the following MPCD combinations are addressed in the subsequent analyses:

- Primary treatment (as represented by existing Navy gravity coalescence equipment);
- Primary treatment plus filter media;
- Primary treatment plus membrane filtration; and
- Collection, holding, and transfer (CHT).

Certain vessel group analyses do not include those options above in cases where they were eliminated from evaluation as a result of the feasibility analysis (see the *Feasibility Impact Analysis Report Surface Vessel Bilgewater*, hereafter referred to as the Bilgewater Feasibility Impact Analysis Report (FIAR)) (Navy and EPA, 2002b). In addition to the above MPCDs that passed the screening process, the Armed Forces is currently developing pollution prevention (P2) programs that are intended to reduce discharge volume and eliminate discharge constituents. For more information on the Armed Forces pollution prevention programs, please refer to (Shipboard Compliance and Pollution Prevention Program).

1.1 VESSEL GROUPS

To facilitate the feasibility and environmental effects analyses (EEA), and due to the large number of vessel classes and designs, Armed Forces vessels were sorted into vessel groups according to similarities in engineering and discharge characteristics. Vessels that produce bilgewater/OWS discharge were sorted into vessel groups using a tiered process. The discriminating tiers were: surface vessels that produce bilgewater/OWS discharge; vessel operational status; type of propulsion system; bilgewater and dirty ballast processing; vessel size; type of bilge; engine placement; and new designs. A representative vessel class was selected for each vessel group based on how accurately it depicts the group's characteristics. For complete details for each vessel group, see the *Vessel Grouping and Representative Vessel Selection for Surface Vessel Bilgewater/Oil-Water Separator Discharge* (Navy and EPA, 2001g).

The specific vessel classes that were selected to represent each vessel group are (Figure 1-1):

- Non-operational vessels: USS NEWPORT (LST 1179)
- Nuclear Steam Propulsion: USS NIMITZ (CVN 68)
- Conventional steam ships: USS WASP (LHD 1)
- Vessels with Gas turbine with dry bilge: USS ARLEIGH BURKE (DDG 51)
- Vessels with Gas turbine with wet bilge: USS SPRUANCE (DD 963)
- Diesel ships OWS process bilgewater and dirty ballast: WHEC 378
- Large diesel ships (6000 tons of displacement or more): USS WHIDBEY ISLAND (LSD 41)
- CI vessels process only bilgewater with displacement between 400 and 4000 tons: MCM 1
- Small diesel ships (65 feet or more in length and under 400 tons of displacement): WPB 110
- CI boats under 65 ft: UTB 41
- SI inboard vessels: QST 35
- SI outboard vessels: CB-M

- Non-powered vessels: YC 1607

Figure 1-1. Bilgewater Vessel Groupings